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08/206,792	03/04/94	THACKERAY	11M1/0804 YADRA105

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 EXAMINER

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DATE MAILED:

08/04/94

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UNITED STATES DEPARTMENT OF COMMERCE  
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PATENTS AND TRADEMARKS

Washington, D.C. 20231

**BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES**

Paper No. 15

Application Number: 08/206,792

Filing Date: April 1, 1994

Appellant(s): Thackeray et al.

**MAILED**  
**AUG 04 1997**  
**GROUP 1100**

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Mark B. Wilson

For Appellant

**EXAMINER'S ANSWER**

Art Unit: 1111

This is in response to appellant's brief on appeal filed May 20, 1997.

**(1) *Real Party in Interest***

A statement identifying the real party in interest is contained in the brief.

**(2) *Related Appeals and Interferences***

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

**(3) *Status of Claims***

The statement of the status of the claims contained in the brief is correct.

**(4) *Status of Amendments After Final***

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

**(5) *Summary of Invention***

The summary of invention contained in the brief is correct.

**(6) *Issues***

The appellant's statement of the issues in the brief is correct. However it is noted that issues numbers 2 and 3, are amended (see new grounds of rejection).

Art Unit: 1111

Hence, issue 2 is now moot as the rejection is withdrawn.

Issue 3 is: Are claims 1, 3-20 obvious over Thackeray et al. '371 in view of Thackeray et al. '877?

**(7) *Grouping of Claims***

Appellant's brief includes a statement that claims 5, 6, 16 and 17 do not stand or fall together and provides reasons as set forth in 37 CFR 1.192(c)(7) and (c)(8).

**(8) *ClaimsAppealed***

The copy of the appealed claims contained in the Appendix to the brief is correct.

**(9) *Prior Art of Record***

The following is a listing of the prior art of record relied upon in the rejection of claims under appeal.

4,507,371	Thackeray et al.	3/26/85
4,980,251	Thackeray et al.	12/25/90
5,316,877	Thackeray et al.	5/31/94

**(10) *New Prior Art***

No new prior art has been applied in this examiner's answer.

Art Unit: 1111

**(11) *Grounds of Rejection***

The following ground(s) of rejection are applicable to the appealed claims:

***Claim rejections 35 USC 103***

1. Claims 1, 3-4, 7-15 and 18-20 are rejected under 35 U.S.C. § 103 as being unpatentable over Thackeray et al. 4,507,371.

The instant claims are drawn to an electrochemical cell having an anode, a cathode and an electrolyte. At least part of the anode comprises a transition metal oxide spinel having the formula of claim 1. The cathode is a metal oxide compound and the electrolyte may be a solid or a liquid..

Thackeray et al. '371 shows a spinel lithium manganese dioxide with stabilizing cations (col. 1, lines 11-24 and col. 2, lines 47-50). The anode and cathode may be made with the spinel material. The electrolyte may be one containing a lithium salt and a solvent (col. 5, lines 10-16) or it may be a solid (col. 4, lines 47-53). Moreover, specific anode and cathode materials are listed in col. 6, lines 1-20. These materials may act as an anode, a cathode or both (col. 4, lines 9-17 and lines 54-67). The spinel structure is a transition metal oxide which accepts lithium within its interstitial spaces during lithiation (col. 3, lines 13-19). (This is indicative of a rechargeable rocking chair cell, i.e. lithium is accepted by one of the electrodes during charging and rocks back to the opposite electrode during discharge). Further evidence that the cell is a rocking chair cell is seen in col. 5, lines 47-59 wherein it is taught that during discharge of the cell M cations (I.e. Li, Cu, etc.) Are released from the host framework structure of the anode into the

Art Unit: 1111

electrolyte with a simultaneous oxidation of B-type cations in the anode framework structure. At cathodes having the spinel formula disclosed during discharge of the cell M cations from the electrolyte enter the host framework structure of the cathode with a simultaneous reduction of a B-type cation of the cathode. The reverse processes can occur on charging of the cell. Also, it is disclosed that the material exhibits a two phase region which results in a two phase electrode (col. 3, lines 47-59).

The reference lacks only by failing to explicitly state that mean oxidation state of the cations nor does it explicitly state the voltages against lithium.

However, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because the artisan has sufficient skill to recognize the valency of the cations during charge and discharge, as the prior art discloses different cations valencies (see col. 3, lines 47-58). Similarly, the artisan has sufficient skill to recognize that the voltages of the instant materials at the two phase regions will be the same as that of the prior art as the spinel structure is the same and the same cations are selected for forming the transition metal oxide.

**(12) *New Ground of Rejection***

Claims 1, 3-20 are rejected under 35 U.S.C. § 103 as being unpatentable over Thackeray et al. 4,507,371 in view of Thackeray et al. 5,316,877.

Art Unit: 1111

Thackeray et al. '371 shows a spinel lithium manganese dioxide with stabilizing cations (col. 1, lines 11-24 and col. 2, lines 47-50). The anode and cathode may be made with the spinel material. The electrolyte may be one containing a lithium salt and a solvent (col. 5, lines 10-16) or it may be a solid (col. 4, lines 47-53). Moreover, specific anode and cathode materials are listed in col. 6, lines 1-20. These materials may act as an anode, a cathode or both (col. 4, lines 9-17 and lines 54-67). The spinel structure is a transition metal oxide which accepts lithium within its interstitial spaces during lithiation (col. 3, lines 13-19). (This is indicative of a rechargeable rocking chair cell, i.e. lithium is accepted by one of the electrodes during charging and rocks back to the opposite electrode during discharge). Further evidence that the cell is a rocking chair cell is seen in col. 5, lines 47-59 wherein it is taught that during discharge of the cell M cations (I.e. Li, Cu, etc.) Are released from the host framework structure of the anode into the electrolyte with a simultaneous oxidation of B-type cations in the anode framework structure. At cathodes having the spinel formula disclosed during discharge of the cell M cations from the electrolyte enter the host framework structure of the cathode with a simultaneous reduction of a B-type cation of the cathode. The reverse processes can occur on charging of the cell. The material exhibits a two phase region which results in a two phase electrode (col. 3, lines 47-59). The anode may also comprise a lithium metal as seen in col. 3, lines 20-25.

The only difference between the reference and the claims is seen in some of the spinel structure compound.

Art Unit: 1111

However, '877 teaches a spinel material having two of the claimed structures, i.e.  $\text{Li}_2\text{Mn}_4\text{O}_9$  and  $\text{Li}_4\text{Mn}_5\text{O}_{12}$ . (col. 1, lines 46-63). The materials are used in a lithium rechargeable cell as the cathode material. These materials can operate at 4.0V as well as 3.0 V (col. 5, lines 65-68). The anode of the cell may comprise a lithium containing material, as lithium metal, etc. (Col. 3, lines 6-14).

Thus, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because the skilled artisan recognizes the spinel materials of the '877 patent may be used as an anode as well because the '371 reference teaches that when a spinel cathode is used, the anode may comprise a lithium anode or it may comprise the spinel materials used as the cathode. The artisan has sufficient skill to substitute a lithium metal anode with a lithium spinel as it is known in the art that in a secondary cell a lithium anode may be substituted with a lithium containing transition metal oxide having the same spinel structure as the cathode.

**(13) Response to argument**

*Rejection of claims 1, 3-4, 7-15 and 18-20 over Thackeray et al. '371*

The arguments presented by the Applicants do not overcome the rejection. The assertion that the '371 patent deals with combinations of spinel material electrodes with non-spinel material electrodes in general fashion only is not persuasive. The reference is clear in its teaching that the

Art Unit: 1111

that the material of the '371 cathode meets the requirement of "transition metal oxide" comprising the instant cathode.

Moreover, the assertion that the only example of a battery in the '371 patent selects a lithium anode does not remove the teachings of the patent wherein both the anode and cathodes can be made with transition metal oxides. It is noted that even though the example uses a lithium anode the teachings of the entire patent are relied upon to reject the instant claims, as the example is not the only part of the reference that is relevant. Thus, contrary to the assertion that the '371 does not suggest a rocking chair cell because a lithium anode is used, the prior art by implication discloses a rocking chair battery. In that, when both electrodes comprise the transition metal spinel the lithium is mobile within the interstitial spaces of the spinel material. This suggests that the lithium rocks from one electrode to the other electrode upon charging and upon discharge the lithium "rocks" back to the other electrode.

The assertions that the prior art must fairly suggest to one skilled in the art the entire teachings of the claimed invention in order to have a *prima facie* obviousness rejection is agreed with. In the instant situation the prior art explicitly states that the materials which accept lithium in its interstitial spaces may be the anode and cathode. Not only is this clear guidance on how to manufacture a secondary battery but it also clearly suggests to the skilled artisan that a rocking chair cell results when two transition metal oxide electrodes comprise the active material.

The assertion that the rejection is improper because the '371 patent should not be considered analogous art is without merit. It seems curious to state that a battery having

Art Unit: 1111

transition metal oxide electrodes and a solid electrolyte is not analogous to a cell of the prior art having the same transition metal oxide electrodes and the same electrolyte system. It is believed that a battery having the same components as a battery of the prior art may be seen as analogous art by a skilled artisan.

***(14) Period of Response to New Ground of Rejection***

In view of the new ground of rejection, appellant is given a period of TWO MONTHS from the mailing date of this examiner's answer within which to file a reply to such new ground of rejection. The reply may include any amendment or material appropriate to the new ground of rejection. Prosecution otherwise remains closed. Failure to respond to the new ground of rejection will result in dismissal of the appeal of the claims so rejected.

Art Unit: 1111

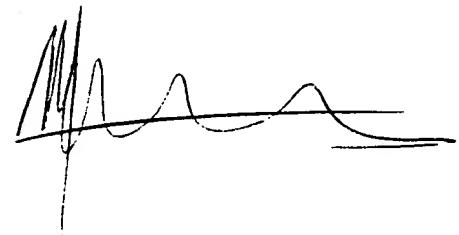
For the above reasons, it is believed that the rejections should be sustained.

*Approved*  
*Prince Willis*  
Prince Willis, Jr.  
Supervisory Patent Examiner  
Patent Examining Group 110

Respectfully submitted,

M. NUZZOLILLO  
PRIMARY EXAMINER  
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July 27, 1997



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